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RE-DEFINING URBAN AREAS IN SRI LANKA

BILESHA WEERARATNE



INSTITUTE OF POLICY STUDIES OF SRI LANKA



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Abstract

The existing urban population estimate in Sri Lanka fails to reflect the true level of urbanization due to the inappropriate definition adopted. This paper develops an alternative definition for urban areas in Sri Lanka to reconcile the mismatch between actual and existing estimates, by reviewing definitions adopted in other countries and analyzing perceptions of Key Informants.

The author defines a Grama Sevaka division as urban if it has a minimum population of 750 persons, a population density greater than 500 persons per km², firewood dependence of less than 95 percent of households, and well water dependence of less than 95 percent of households. Using data from the Land Use Policy Planning Department and Department of Census and Statistics, the author estimates that 43.8 percent of Sri Lankan population live in urban areas.

The paper makes an important contribution to Sri Lanka's policy and legislative arena to revise the existing definition of urbanization.

Author Keywords: Urbanization, Sri Lanka

JEL classification codes: R11, R12

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ශ්‍රී ලංකාවේ වත්මන් නාගරික ජන තක්සේරුව පිළිබඳව නිවැරදි අර්ථ දැක්වීමක් නොමැතිවීම නිසා නාගරීකරණයේ සැබෑ තත්වය විඳහා දැක්වීමට අසමත් වී ඇත. මෙම පත්‍රිකාව මගින් වෙනත් රටවල අනුගමනය කරන අර්ථකතන විමසුමට ලක් කරමින් හා ප්‍රධාන තොරතුරු ප්‍රවාහ විභාග කරමින් තර්ජන සැබෑ ඇස්තමේන්තු අතර ඇති වෙනස හුවා දැක්වීමට අදාළව ශ්‍රී ලංකාවේ නාගරික ප්‍රදේශ පිළිබඳව විකල්ප අර්ථ දැක්වීමක් ඉදිරිපත් කරයි.

මෙම විකල්ප අර්ථකතනයට අනුව ජනගහණය 7500 වැඩි, ජන ඝනත්වය වර්ග කිලෝ මීටරයට පුද්ගලයන් 500 වැඩි, දුර ඉන්ධන භාවිතය නිවාස 95% අඩු, හා ලිං ජලය භාවිතය 95% අඩු ග්‍රාම සේවක වසම් නාගරික ලෙස සැලකේ. ඉහත විකල්ප අර්ථකතනයට අනුව ශ්‍රී ලංකාවේ ජනගහණයෙන් 43.8% ක් නාගරික ප්‍රදේශවල වාසය කරති.

නාගරීකරණය පිළිබඳව ඇති වත්මන් අර්ථ දැක්වීම ප්‍රතිශෝධනය කිරීම සඳහා මෙම පත්‍රිකාව මගින් ශ්‍රී ලංකාවේ ප්‍රතිපත්තිය හා ව්‍යවස්ථාදායක ක්ෂේත්‍රයට අගනා දායකත්වයක් ලබා දේ.

பிரித்தெடுப்பு

பொருத்தமற்ற வரைவிலக்கணம் பயன்படுத்தப்பட்டமையின் காரணமாக இலங்கையின் உண்மையான நகர மயமாக்கலை இலங்கையின் தற்பொழுதைய நகர சனத்தொகை தொடர்பான மதிப்பீடு வெளிப்படுத்த தவறிவிட்டுள்ளது. கிடைக்கக் கூடிய முக்கியமான தகவல்களின் நோக்கு ரீதியான பகுப்பாய்வு மற்றும் ஏனைய நாடுகளில் பயன்படுத்தப்படுகின்ற வரைவிலக்கணங்களை மீளாய்வு செய்வதன் ஊடாக உண்மையான மற்றும் தற்பொழுது காணப்படும் மதிப்பீடு ஆகியவற்றுக்கிடையேயான பொருத்தப்பாடின மையினை இணக்கம் செய்யும் நோக்கில் இலங்கையில் நகரப்புறங்களுக்கான மாற்றுவழி வரைவிலக்கணமொன்றை இந்த ஆய்வு பத்திரம் அபிவிருத்தி செய்கின்றது.

கிரமா சேவையாளர் பிரிவு ஒன்றில், ஆகக் குறைந்த சனத்தொகை 750 பேர், இரண்டு கிலோமீற்றர் சதுர பரப்பளவில் 500 பேர் கொண்ட இனச் செறிவு, வீட்டுத் துறையினரில் 95 சதவீதத்திலும் குறைவானவர்கள் விறகுத் தேவையில் தங்கியிருத்தல் மற்றும் வீட்டுத் துறையினரில் 95 சதவீத்திற்குக் குறைவான மக்கள் கிணற்று நீர் தேவையில் தங்கியிருக்கின்றமையினை கொண்டிருப்பின் அந் நிலைமையினை இந்த எழுத்தாளர் நகரப் பிரதேசமாக வரையறுக்கின்றார். இலங்கைச் சனத்தொகையில் 43.8 சதவீதமான மக்கள் நகரப் பிரதேசங்களில் வாழக்கின்றார்கள் என காணிப் பயன்பாட்டு திட்டமிடல் திணைக்களம் மற்றும் குடித்தொகை மற்றும் புள்ளிவிபரவியல் திணைக்களத்தின் தரவுகளைப் பயன்படுத்தி எழுத்தாளர் மதிப்பீடு செய்கின்றார்.

தற்பொழுது காணப்படும் நகரமயமாக்கல் தொடர்பான எண்ணக்கருத்தை மாற்றுவதற்கு இலங்கையின் கொள்கை வகுப்பாளர்கள் மற்றும் சட்டவாக்கத் துறையினருக்கு மிக முக்கியமாதொரு பங்களிப்பினை இந்த ஆய்வு அறிக்கை வெளிப்படுத்துகின்றது.

1. Motivation

Sri Lanka is a middle income economy with a visibly high rate of urbanization and grand plan for further urbanization through the envisioned Western Region Megapolis Project (WRMPP, 2016). Nonetheless, the latest statistics indicate that only 18.2 percent of the population live in urban areas. This does not reflect the true level of urbanization in Sri Lanka. World Bank (n.d., pg.8) notes that 'while urbanization data in Sri Lanka are much debated, there is consensus that the country is urbanizing faster than the statistical figures suggest'. Similarly, Ellis & Roberts (2016) note that many cities in Sri Lanka are "under-bounded" - the true extent of the city extends beyond its administrative boundaries, while as much as one-third of the population may be living in areas that ought to be classified as urban areas. Reinforcing this, DCS (2014, pp. 10) confirms that the current definition underestimates the degree of urbanization and the urban population 'would have been much higher if the definitional issues were resolved'.

The issues concerning the definition of urbanization revolve around its administrative underpinnings. As per the existing definition, Municipal Councils (MCs) and Urban Councils (UCs) are considered urban areas. Until 1987, in addition to MCs and UCs, Town Councils (TCs) were also considered urban. However, the change in the administrative structure in 1987 abolished TCs, and absorbed them under the Pradesheeya Sabha (PS) - which are considered rural. As such, despite urbanization being an

The latest statistics indicate that only 18.2 percent of the population live in urban areas. This does not reflect the true level of urbanization in Sri Lanka.

indicator of economic development of a country and living standards of the people, the current official statistics (18.2 percent) fail to reflect the actual population that live in urban areas in Sri Lanka.

Nonetheless, the latest development plans have a massive emphasis on urban areas such as developing entire Western Region into a Megapolis. These development initiatives compounded by movement of people into urban areas will expand the urban population by many folds. In order to better address the challenges and issues that will accompany urbanization, Sri Lanka should be geared with a better understanding about the characteristics of urban areas and its population. Such understanding will facilitate the mitigation of adverse issues on urban housing, transportation, health and crime to name a few. As such 'it is important to introduce a realistic

definition of urban areas taking into account the characteristics of the population rather than based on administrative considerations alone' DCS ([2014], pg.74). Ellis & Roberts (2016) highlights that such a definition should be based on functional instead of administrative criteria.

In this context, this paper develops an alternative definition for urban areas in Sri Lanka with the purpose of economic integration. The new definition is based on a mixed methodology of analyzing definitions used in other countries and perceptions of Key Informant

As such 'it is important to introduce a realistic definition of urban areas taking into account the characteristics of the population rather than based on administrative considerations alone' DCS ([2014], pg.74).

Interviews (KIIs). Related alternative estimates are based on Gramaseva Niladhari Division (GND) data sourced from the Department of Census and Statistics (DCS) and the Land Use Policy Planning Department (LUPPD).

The remainder of the article is organized as follows. Section 2 highlights the policy context for a better definition and estimates of

urbanization in Sri Lanka. Section 3 examines the evolution of the urban definition in Sri Lanka and discusses the issues involved with the existing definition. Section 4 reviews the definitions of urban areas adopted by different countries to identify potential criteria to be included in an alternative definition for urbanization in Sri Lanka. Based on this review and KII findings, Section 5 develops an ideal definition for urban areas in Sri Lanka and

discusses the practical issues of adopting such a definition. Considering data availability and implementation issues, Section 6 takes a more realistic approach and develops an alternative definition. Section 7 discusses the alternative definition and related estimates in the context of other definitions and estimates, while Section 8 concludes the paper with a summary.

2. Policy Environment

The current policy scenario in Sri Lanka has a significant emphasis on urban areas. Specifically, in the planned Western Region Megapolis Project two of the three broad goals focus on urbanization. One aims to address repercussion of 'messy urbanization', which has resulted in congestion pressure on urban physical structures, urban services and amenities and the environment, while the other aims to avoid a middle income trap by leveraging economies of agglomeration, through development and transformation of physical infrastructure. Together, these goals are aimed at '... the spatial transformation of urban agglomerations in the Western Region of the country and the structural transformation of the National Economy as a whole' WRMPP (2016, pp. 2). As noted before, the official estimates and the established consensus are divergent, hence there is no clear understanding about who are currently urban dwellers and who would become urban dwellers in the near future. Clarity on the diverse lifestyles and livelihoods of the urban and rural

population are critical for the success of the Megapolis project.

The 10 key projects identified in the WRMPP (2016) spans both rural and urban landscapes in the region. Nonetheless, as highlighted in WRMPP (2016, pp. 98) 'most of the catalyst projects identified are proposed based on the assumptions that there is demand and that the land is available for development, although pre-feasibility study has not been done and some of the land for the projects are not yet acquired'. As such, land acquisition would inevitably involve relocation, and successful relocation requires adequate sensitivity to the differences in urban and rural lifestyles and livelihoods. Such sensitivity cannot be achieved without clearly distinguishing urban areas from rural areas, nor distinguishing urban population from rural population. Similarly, pre-feasibility studies of the proposed projects ought to pay due homage to the respective urban and rural characteristics of the underlying area.

In addition to the Western region, the ongoing policy focus also aims to develop the Greater Kandy region

Clarity on the diverse lifestyles and livelihoods of the urban and rural population are critical for the success of the Megapolis project.

beyond the limits of the Kandy MC which spans 26.8 square kilometres (km²) and 45 GNDs, to approximately 210 km² and 275 GND (Elkaduwa & de A. Samarasinghe, 2016). Similarly,

there is policy focus to develop 500,000 new houses in rural, urban and semi-urban areas spanning the entire country complete with neighbourhoods that have hospitals, schools, shopping complexes and other amenities, as well as develop

20-200 square mile zones dedicated for economic activity and social development with necessary amenities (Prime Minister, 2015).

Despite this current policy emphasis on urbanization, the definition adopted for urban areas in Sri Lanka

has been inconsistent. The next section depicts how the definition of urban areas has evolved over the years.

3. Evolution of Urban Definition in Sri Lanka

Early literature shows that the history of urban definition in Sri Lanka stems from ministerial discretion, where the Minister of Local Government may create (in ascending order) a village, town, urban or municipal council or upgrade from one status to the next, for local administrative purposes. Such discretion is noted to be guided by the nature of development, amenities or urban characteristics as well as by personal and political considerations of those in office (Jones & Selvaratnam, 1970; Wanasinghe & Karunanayake, 2003). Against this backdrop, until 1987 urban sector in Sri Lanka comprised of MC's, UC's and TC's. The MCs are defined as per the Municipal Councils Ordinance of 1947, UCs as per the Urban Councils Ordinance of 1939 and TCs under the Town Council Ordinance of 1946. Rural and estate sectors are governed by PS, while the estate sector is defined as plantations of 20 acres or more in extent upon which there are 10 or more residential labourers, and all areas excluding urban and estate are defined as rural areas.

In 1987 the enactment of the 13th Amendment to the Constitution recalibrated administrative units in

Sri Lanka and TCs were abolished and their administration was absorbed into PS. The control and supervision of local government units were transferred from Central Government to the Provincial Councils, which were also created as per the Amendment. In Figure 1 the change in definition is marked by the vertical dashed line at 1987. Prior to the change in definition, the 1981 census reported 21.5 percent of Sri Lankan population living in urban areas, while the estimates for 2001 dropped to 13.1 percent. Such a decline in urbanization is mainly because 89 previously 'urban' settlements were later classified as 'rural' settlements after the 13th Amendment. Such downgraded TCs included some of the most dynamic and densely populated suburbs of Colombo such as Maharagama and some fast growing small towns in the Dry Zone. As noted in literature (Uduporuwa, 2010; Wanasinghe & Karunanayake, 2003) after 1987, 21 towns in the Colombo Metropolitan Region lost their urban status and 9 and 6 towns in the district of Jaffna and Galle also lost the urban status, respectively.

The current administrative definition in Sri Lanka has a serious limitation due to its static nature, which does

Prior to the change in definition, the 1981 census reported 21.5 percent of Sri Lankan population living in urban areas, while the estimates for 2001 dropped to 13.1 percent.

not capture the dynamism of urbanization in Sri Lanka. This is an inadvertent by-product of the definition being based on administrative criteria. Due to this rigid administrative structure, many vibrant areas that reflect urban characteristics still remain

The current administrative definition in Sri Lanka has a serious limitation due to its static nature, which does not capture the dynamism of urbanization in Sri Lanka.

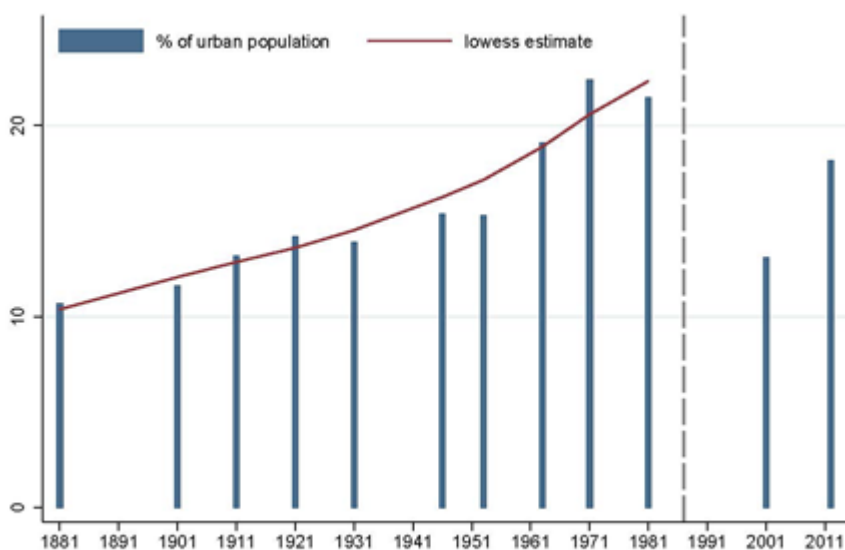
classified as rural. Some such cases are the areas that fall under Homagama and Kelaniya PS's in Colombo and Gampaha districts, respectively. The Homagama DSD has a population of 237,905 and spans an area of 121 km², resulting in a population density of 1966 persons per km². Similarly, Kelaniya has a population of 137,339 and a population density of 6,271 persons per km². Under the current definition, these vibrant cities cannot be classified as urban areas unless their respective PS's are upgraded to the status of a UC or MC. As per the 13th Amendment, the Central Government maintains the power to create, promote or dissolve local authorities. Exercising such powers, in 2011, several PS's were graduated to higher order local authorities. For instance, the Kaduwela PS became an MC,

Eravur PS was promoted to a UC, and two new MC's were created for Akkaraipattu and Dambulla (ColomboPage, 2011). Presently, 23 MCs and 41 UCs constitute the urban sector while 271 PSs make up the rural and estate sectors.¹ See Appendix A1 for the list of MCs and UCs as of 2011, and Appendix A2 for the list of PSs.

Adding another dimension to the issue of urban-rural classification, the Urban Development Authority Law No. 41 of 1978, allows the relevant Minister to very loosely declare an area as an 'Urban Development Area' if in his 'opinion' any area is suitable for development (UDA Law, 1978.). As such, many areas that are otherwise classified as rural are also simultaneously declared as urban development areas.

Other than the ad hoc upgrading of local authorities, which then results in change in urban-rural classification, and the arbitrary declaration of urban development areas by UDA, the existing definition lacks a mechanism to regularly review and change the classification. On the contrary, some countries have flexible and dynamic definitions that accurately reflect urbanization in that country. The next section reviews definitions of urban areas adopted by various other countries.

**Figure 2.1
Urban Population in Sri Lanka 1881-2012**



Source: DCS (2015).

¹ This includes the four new Municipal Councils, one Urban Council and nine Pradeshiya Sabhas established in 2011.

4. Review of Urban Definitions

There is no universally accepted definition for 'urban' and 'every country defines "urban" independently' (UNESCAP, 2013, pg. 14), and the United Nations Statistics Division notes that countries must establish their own definitions in accordance with their own needs (UNSTATS, n.d.). Often, definitions of urbanization involves one or more of the following characteristics; administrative criteria, economic criteria, population-related criteria and urban criteria related to the functional nature of urban locations.

Buettner (2014, pp. 5) notes that out of the 231 countries reported in the 2011 Revision of the World Urbanization Prospects, 121 countries have adopted a single criterion, while 84 countries used a combination of criteria. Among single criterion, 64 countries have adopted a definition that is purely based on administrative criteria, 48 have adopted a pure population size/density related criteria while 9 countries have adopted a pure urban characteristics. Among combinations, most common were administrative and population size/density, followed by economic and population size/density and population and urban characteristics.

Other than Sri Lanka, some other countries that adopt administrative definitions include Poland, Bangladesh, Pakistan, Thailand and Romania. In the case of Thailand, all municipal areas are considered as urban, while in Pakistan, the 1998 census defined urban areas as all localities which

are either metropolitan corporation, municipal corporation, municipal committee or cantonment (Ali, 2013). See Appendix A3 for a list of urban definitions adopted by countries. However, such an administrative criterion only determines urban areas based on one aspect. Hence, when defined as per administrative criteria, urbanization levels and urban population growth rates may be under-reported and growth taking place in urban peripheries, which is beyond the boundaries of 'urban' areas may not be considered as urban activities (UNESCAP, 2013). Additionally, when the administrative boundaries of cities remain fixed for long periods of time, they are likely to misrepresent the actual growth of a city with respect to both its territory and its population (UN, 2014).

As an alternative to administrative definitions for urban areas, other definitions are based on population size, population density, economic functions, availability of certain infrastructure and availability of certain services to name a few. For instance, India uses a combination of criteria - namely, minimum population of 5,000, a minimum density of 1,000 per square mile and at least 75 percent of the adult male population being employed in non-agriculture activities. In US 'urban' consists of all territory, population, and housing units in urbanized areas and in places of 2,500 or more persons outside urbanized areas (US Census Bureau, 1995).

Among existing definitions, a very pragmatic definition that reflects

‘Every country defines “urban” independently’ (UNESCAP, 2013, pg. 14).

reality in urbanization is the 'functional economic units' developed by the OECD under its definition of urban areas which overcomes the limitations of administrative definitions (OECD, 2013). The building blocks for this functional urban areas is the smallest administrative units for which national commuting data are available. This OECD definition uses population density to identify urban cores and travel-to-work flows to identify the hinterlands whose labour market is highly integrated with the cores. Initially this methodology uses gridded population data to define urbanized areas or 'urban high-density clusters' over the national territory, ignoring administrative borders since urban cores are defined through gridded population data. An urban core consists of a high-density cluster of contiguous grid cells of 1 km² with a density of at least 1,500 inhabitants per km² and in some cases lower threshold of 1,000 people per km². An important innovation of this methodology is the use of commuting data to focus

on the relationships among densely inhabited cores that are physically separated, but economically integrated. Here two urban cores are considered integrated, and thus part of the same polycentric metropolitan area, if more than 15 percent of the residence population of any of the cores commutes to work in the other core. Final step of the methodology consists in delineating the hinterland of the metro areas defined as the 'worker catchment area' of the urban labour market, outside the densely inhabited core. The size of the hinterland, relative to the size of the core, gives clear indications of the influence of cities over surrounding areas. Urban hinterlands are defined as all municipalities with at least 15 percent of their employed residents working in a certain urban core.

Another very practical solution to a realistic definition for urbanization,

which addresses the comparability issues of national urbanization statistics, is the Agglomeration Index (AI) (Chomitz et al., 2005; Uchida & Nelson, 2008). The AI classifies an area as urban based on three criteria (1) minimum population size used to define a sizable settlement, (2) minimum population density, and (3) maximum travel time, by road, to the sizable settlement. The exact calculation involves five steps - identification of the centres of sizable settlements; determination of the sizable settlements border; creation of population density grids; identification of grid cells that satisfy thresholds for all three criteria and finally, aggregation of grid cell populations. However, as noted by Uchida & Nelson (2008, pp.2), the AI 'does not define what is urban per se - it does not incorporate urban characteristics such as political status and the presence of particular services or activities'. The focus of

the AI is to create a global definition of settlement concentration that facilitates cross-country comparative analyses. As such, the estimates of the AI is sensitive to the choice of threshold/criteria combination - i.e., population density of 150 people per km², 60 minutes travel time to a 'sizeable' population, and a minimum population of 50,000.

Frey & Zimmer (1998) identifies three elements that best distinguish rural from urban character - ecological, economic and social. Ecological element is identified as the spatial consideration and the economic element includes the functions and the activities that take place within the area, while the social element is the nature of people - their behavioural characteristics, their values and the way they perceive the world and way they interrelate.

5. Ideal Definition

Regardless of the definition adopted, urban areas are different from rural areas. As noted by UNSTATS (n.d.) 'the traditional distinction between urban and rural areas within a country has been based on the assumption that urban areas, no matter how they are defined, provide a different way of life and usually a higher standard of living than are found in rural areas'. Resonating this, Key Informant Interviews (KII) depict a

picture of urban areas as bustling areas with ample services, facilities and amenities; fewer natural spaces; and a higher concentration of people living in close proximity to each other and economic activity. In order to capture these characteristics and functions of urban areas and its population, an alternative definition ought to include indicators that reflect these ecological, economic and social characteristics (Frey & Zimmer, 1998).

However, prior to selection of criteria for defining urban areas, it is important to identify the geographic unit of analysis. UNSTATS (n.d.) identifies that the ideal would be a locality and if not the smallest administrative unit of the country. In the case of Sri Lanka, a locality is a village. However, in terms of availability of data and practical considerations of estimating urbanization in Sri Lanka, GND - the smallest administrative unit, is more suited.² At the time of the 2012

² For administrative purposes Sri Lanka is divided into 9 provinces and 25 districts. These districts are further divided into 331 Divisional Secretary Divisions (DSD). DSDs are again sub- divided into GNDs.

An alternative definition ought to include indicators that reflect these ecological, economic and social characteristics (Frey & Zimmer, 1998).

Census there were 14,022 GNDs in Sri Lanka.

In this light, the ecological element could be the plot area ratio, while the economic element is the ratio of non-agriculture employment, followed by population density and population size as the social element. Plot area ratio is the built area divided by plot area of a land parcel. The cut off for plot area ratio could be set to greater than 0.66 - the maximum ratio allowed in residential plots in Sri Lanka. Non-agriculture employment ratio is the ratio between the number of persons occupied in non-agriculture jobs to total occupied persons in the area. This non-agriculture

employment ratio could be set to greater than 0.75 to be consistent with other countries that have adopted this criteria (see Appendix A3). Population density is the number of persons living in an area divided by the land extent of that area. The critical value for population density could be set to greater than 500 persons per km² and the minimum GND population could be set to 750, which are comparable to definitions adopted in other countries and reasonable in the context of the geographic unit considered here. Against this backdrop, an ideal definition for urban areas is, if a GND has a minimum population of 750 persons, a population density greater than 500 persons per km², an average plot area ratio greater than 0.66, and non-agriculture employment ratio greater than 0.75, such a GND is defined as an urban area.

The application of this ideal definition faces issues due to the absence of or difficulty in accessing required data. Plot ratio data is available at local authorities that approve building plans. However, such data is not stored in a manner that facilitates ready access and analysis. Moreover, such data would require corrections for unauthorized construction not reflected in administrative data. Labour Force Surveys (LFS) regularly conducted by the DCS, capture information on non-agriculture employment. However, the LFS is only

representative at the District level. In order to adopt this idealistic definition, employment data is required at the GND level. One way to handle this issue is to increase the sample size of LSF to be representative at GND level. The other is to use employment information from the decennial censuses. However, despite its collection, DCS normally does not process employment data at GND level. Population data at GND level is readily available at the DCS through the decennial censuses and by linking this with land area data (through GIS technology or other sources), population density at GND level can be calculated. However, population density at GND level is not available at DCS.

As such, due to practical implementation issues, the ideal definition identified above cannot be applied yet. Until appropriate data collection is achieved, a stripped down version of the ideal definition, where GNDs with a minimum population of 750 persons and a population density greater than 500 persons per km², can be considered. This estimates 12,566,916 people as urban dwellers accounting for 62 percent of the national population living in 6834 GNDs. To arrive at this estimate the author combines GND level land area data from LUPPD³ with population data from the DCS.

³ However, due to issues in delineating the GND boundaries in post-conflict Jaffna district and other issues, land area data is available for only 12,977 GNDs.

6. Alternative Definition

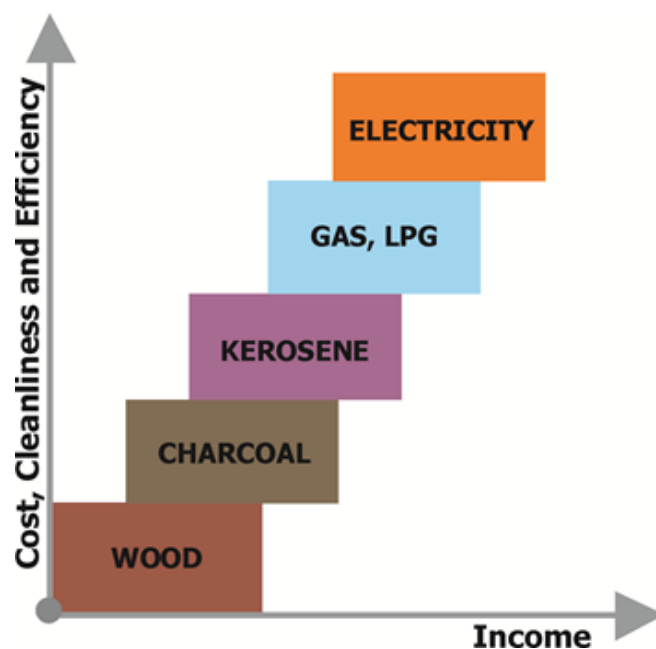
A noticeable limitation of the stripped down version of the ideal definition is the absence of any representation of the ecological and economic elements of the urban population. Until the availability of direct indicators to be included in the estimation process, the best way to overcome this limitation is to adopt reliable proxies that reflect these characteristics.

As mentioned before, the plot area ratio indicates the ecological element or the interdependence of urban population with its environment, while it measures the land area available net of built up area. Interestingly, census data does capture information that can instrument for this ecological element. Specifically, the Housing Information component of the census form, that collects information about the main source of drinking water, and well water⁴ is one of the available options. The existence of a well indicates the availability of unbuilt space in the area since wells are not built under buildings. Moreover, except for a few areas like Colombo, Ratmalana and Ja-Ela, most areas do not have public sewerage systems, hence on-site sanitation such as septic tanks are common (WRMPP, 2016). The guidelines for on-site sewerage systems require a minimum distance of 18 metres between well and soakage pit of septic tank and soakage pit has to be at least 5 metres away from the nearest building (NSWDB, 2016). Moreover, a well or a septic tank needs to be at least 3 feet away from the

boundary of the plot. Based on these building regulations and the fact that nearly 94 percent of households in Sri Lanka rely on septic tanks and pits etc., and that nearly 50 percent of households rely on well water as the main source of drinking water (DCS, [2014]), the existence of a well is a good indication of the availability of open space in a plot. Hence, well water dependency is defined as the share of households relying on well water as the principal source of drinking water.

Similarly, the ratio of non-agriculture employment suggested in the ideal definition is aimed to reflect the economic element of an urban area. A similar socio-economic element can be instrumented with

another indicator - cooking fuel, for which data is available. IEA (2004) notes that higher per capita incomes and increased urbanization will promote the replacement of traditional energy sources with modern ones, while the Energy Ladder (Masera et al., 2000; van der Kroon et al., 2013) provides a theoretical framework to explain this transition. Specifically, the Energy Ladder attributes differences in energy-use patterns between households to variations in economic status. Empirical evidence in Sri Lanka supports the energy ladder hypothesis, which shows that the country as a whole is moving away from traditional fuel such as firewood towards modern fuels such as liquefied petroleum gas (LPG) and electricity (Rajmohan & Weerahewa, 2010).



⁴ Excludes tube-wells.

Similarly, Wickramasinghe (2011) also finds that Sri Lankan households use a portfolio of fuels for cooking consisting of both traditional and modern energy, in line with the energy stacking model and that type of energy used is associated with income. Similarly, Wijayatunga & Attalage (2002) find that in Sri Lanka, biomass consisting mainly of firewood (-0.39) and kerosene are negatively correlated (-0.03) with income, while electricity (0.78) and LPG (0.61) are positively correlated with income. In this context, census information on principal source of energy used for cooking can be exploited as a proxy for the economic element needed in the urban definition, when firewood dependency is defined as the share of households relying on firewood as the principal source of cooking fuel.

In keeping with the ideal definition, it is best if the critical values of the alternative definition can also be objectively determined. However, until defining urban areas becomes a national priority supported by relevant administrative entities that facilitates the development of objective criteria and related data collection, the author resorts to somewhat subjective criteria,



substantiated by the performance of the parameters at a national level and in five selected districts, as well as similar parameters in definitions adopted in other countries. The five districts are Colombo, Gampaha, Kalutara, Kandy, and Galle, which are considered to be most urbanized in Sri Lanka and accounted for highest population densities in 2012 census (DCS, 2014). Moreover, ribbon development radiates out from Colombo along major transport arteries to link it

with Kandy and Galle (Gunawardane, 2015), while the two adjacent districts to Colombo - Kalutara and Gampaha, exhibit urban characteristics and are home to hidden urbanization.

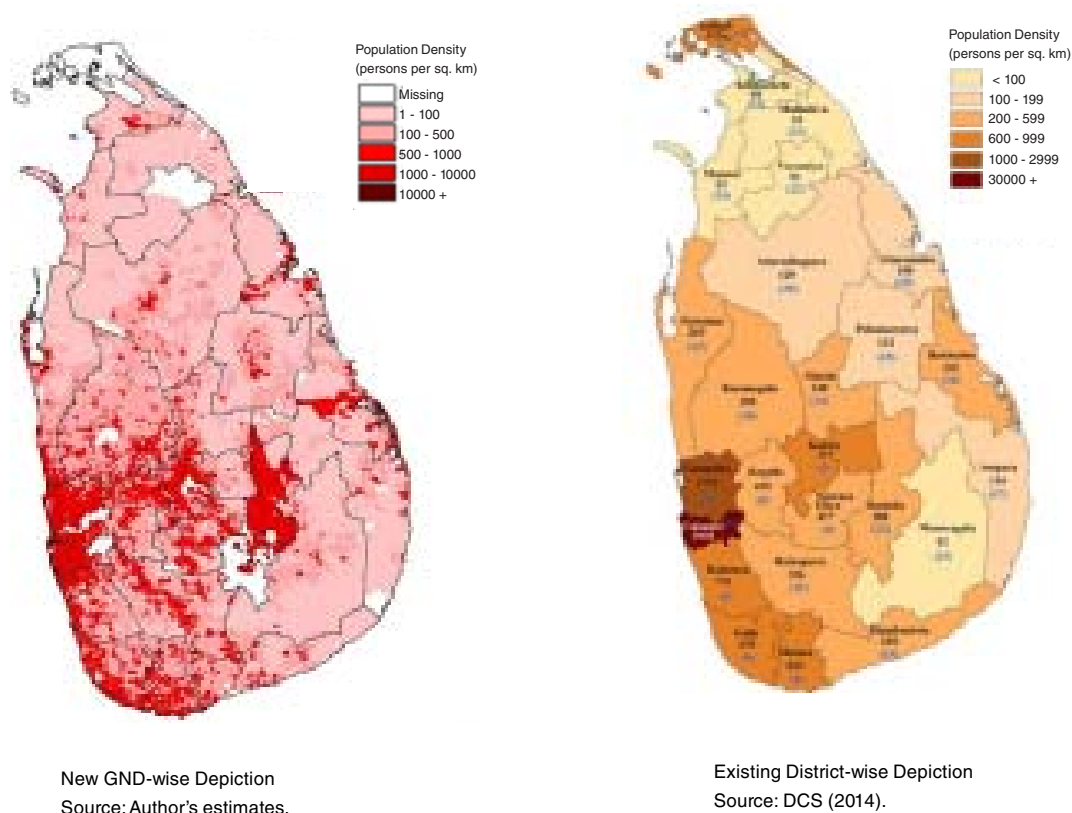
The critical values of 750 for population level and the minimum population density of 500 associated with the ideal definition are also justified by the fact that nearly 75 percent of the GNDs have a population greater than 750 persons (see Left panel of Table 6.1), while

Table 6.1
Distribution of GND Level Population Data - National

	Population			Density			
	Statistics	Percentile		Statistics	Percentile		
Min	1	1%	217	Min	0	1%	12.92
Max	28003	5%	426	Max	84825.87	5%	60.11
		10%	545			10%	113.13
Mean	1455.427	25%	777	Mean	1597.117	25%	261.72
Std. Dev.	1244.312	50%	1131	Std. Dev.	3619.712	50%	564.49
Variance	1548313	75%	1713	Variance	1.31E+07	75%	1429.89
Skewness	4.782615	90%	2623.5	Skewness	8.399101	90%	3755.56
Kurtosis	50.8314	95%	3551	Kurtosis	116.2857	95%	6256.54
Obs	13,990	99%	6311	Obs	13,031	99%	15915.12

Source: Author's calculations.

Figure 6.1
Population Density in 2012



over 80 percent of the GNDs in the five selected districts have a population density greater than 500 persons per km².

The distribution of population density at GND level is shown in the Left panel in Figure 2, where darker shades corresponds to more densely populated GNDs. This is a more nuanced version of the district level population density, often depicted by the DCS (2014) - as seen in the Right panel in Figure 6.1.

The critical value for well water dependency is decided based on the fact that about 85 percent of the GNDs at the national level as well as in the selected districts have a well water dependency ratio less than 95. See Left panel of Table

6.2 and Figure 6.2 for the distribution of well water dependency. The critical value for firewood dependency is decided based on the fact that 50 percent of all GNDs in Sri Lanka and 75 percent of all GNDs in the selected five districts have a firewood dependency of less greater than 95 percent of its households (see left panel of Table 6.2). The distribution of firewood dependency is shown in Figure 6.3.

Combining these criteria, the an alternative definition for urban areas is as follows:

Alternative Definition :
If a GND has a minimum population of 750 persons, a population density greater than 500 persons per km²,

firewood dependence of less than 95 percent households, and well water dependence of less than 95 percent households, such a GND is defined as an urban area.

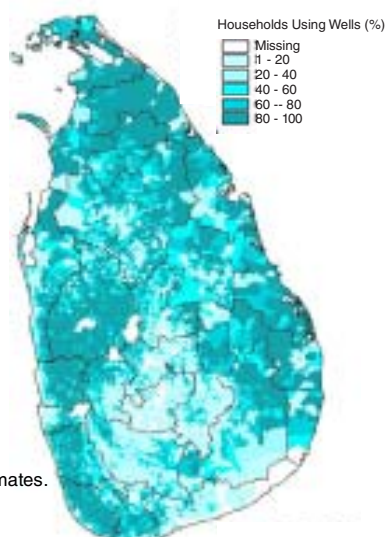
The adoption of these criteria and related critical values 'ensure[s] that the definition used does not become too complicated for application to the census and for comprehension by the users of the census results . . . ' UNSTATS (n.d.). Based on this Alternative definition there are 3,659 GNDs identified as urban areas which is home to 8,334,801 persons. This estimates an urban population of 43.8 percent of the national population.

Table 6.2
Distribution of GND Level Use of Well Water and Firewood

Well Water				Firewood			
	Statistics	Percentile			Statistics	Percentile	
Min	0.00	1%	0	Min	0	1%	10.09
Max	100.00	5%	1.55	Max	100	5%	38.18
		10%	5.19			10%	60.31
Mean	56.19	25%	21.92	Mean	86.85858	25%	84.90
Std. Dev.	34.79	50%	62.26	Std. Dev.	19.77986	50%	95.42
Variance	1210.17	75%	90.36	Variance	391.2427	75%	98.58
Skewness	-0.25	90%	98.02	Skewness	-2.268457	90%	99.59
Kurtosis	1.56	95%	99.32	Kurtosis	7.862988	95%	100.00
Obs	14003.00	99%	100.00	Obs	13,992	99%	100.00

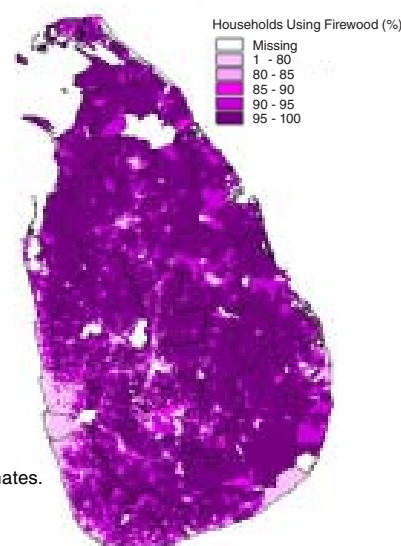
Source: Author's calculations.

Figure 6.2
Well Water Usage at GND Level - 2012



Source: Author's estimates.

Figure 6.3
Firewood Usage at GND Level - 2012



Source: Author's estimates.

Table 3 depicts the district-wise distribution of urban population as per the Alternative definition. Colombo district has a highest share (91 percent) of urban population followed by Gampaha and Kalutara. Figure 5 depicts areas considered urban as per this new definition.

Table 6.3
Alternative Estimates of Urban Population

District	Urban %	District	Urban %
Colombo	90.51	Matale	28.91
Gampaha	67.32	Badulla	28.46
Kalutara	62.09	Mannar	28.46
Kandy	56.98	Matara	25.11
Galle	50.31	Hambantota	23.92
Puttalam	42.77	Nuwara Eliya	23.86
Vavuniya	41.87	Polonnaruwa	16.48
Batticaloa	39.47	Kurunegala	12.84
Ampara	37.53	Anuradhapura	11.94
Kegalle	34.29	Moneragala	6.02
Trincomalee	34.02	Kilinochchi	1.62
Ratnapura	30.40	Mullaitivu	0.90
SRI LANKA	43.80		

Source: Author's calculations.

7. Discussion

As seen in the foregone discussion and clearly depicted in the maps in Figures 2, 3 and 4, there is no perfect correlation between population level, population density, usage of firewood and usage of well water. The combination of criteria which lacks such perfect correlation to define urbanization improves the strength of the definition as it allows to integrate diverse characteristics of urban areas into a composite definition and improve the fluidity of the definition.

As stated, this Alternative definition identifies 3,659 GNDs as urban accounting for 43.8 percent of the Sri Lankan population. This estimate is very close to the 48 percent estimated by the Minister of Megapolis and Western Development - Champika Ranawaka (Gunawardane, 2015), and the 47 percent estimated by the AI (Ellis & Roberts, 2016). The advantage of this Alternative definition over the AI is its appropriateness for Sri Lanka due to the use of country specific characteristics and critical values. Additionally, as noted before, AI's focus is to create a global definition that facilitates cross-country comparative analyses and hence does not incorporate urban characteristics. Moreover, as discussed before, given the small size of Sri Lanka and its relatively widespread transportation networks, the involvement of a criteria on travel time to a sizeable settlement in the AI definition, makes its validity limited to discern urban areas in Sri Lanka. The offered definition is Sri Lanka specific.

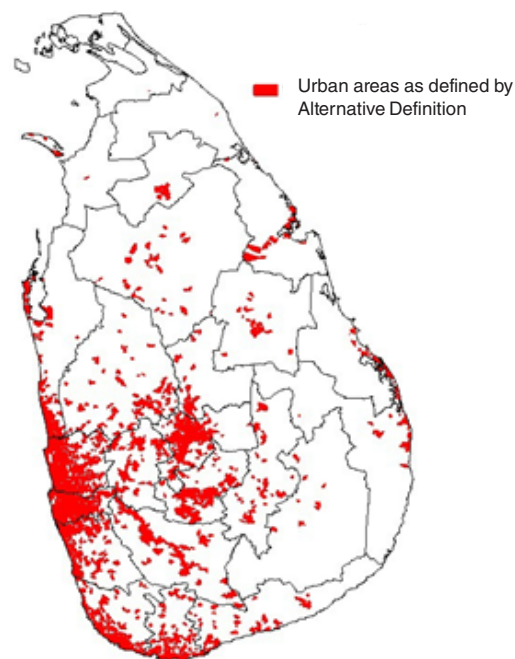
As in the case of most definitions of urban areas, this Alternative

definition is also sensitive to the choice of threshold/criteria combination. Similarly, the appropriateness of the proxies chosen for economic and ecological characteristics of urban areas also affect the validity of the estimates. Nonetheless, this definition has greater flexibility and can be fine-tuned based on future developments and research needs, and has the capacity to remain dynamic and relevant to the dynamic nature of urbanization in Sri Lanka.

The estimate of 43.8 percent urban population developed here is based on Census data. However, a notable limitation of census data for this study is its frequency - once in 10 years, which limits the possibility of providing regular

This Alternative definition identifies 3,659 GNDs as urban accounting for 43.8 percent of the Sri Lankan population. This estimate is very close to the 48 percent estimated by the Minister.

Figure 6.4
Urban Areas as Per Alternative Definition - 2012



Source: Author's estimates.

estimates in inter census years. Nonetheless, despite the census being held once in 10 years, every country including Sri Lanka produces population estimates for inter-census years based on adjustment techniques. Similarly, urban estimates can be calculated for inter-census years. Moreover,

all data used in the calculation of these Alternative estimates of urban areas, are also captured in Household Income and Expenditure Survey (HIES) and Demographic and Health Survey (DHS) conducted in interim years of censuses. HIES is conducted every 3 years and the last HIES was held

in 2012/13 DHS. The DHS is usually held in every 6 to 7 years, while the last was in 2006/7. Hence, relying on more recent survey data and adjustment techniques, Alternative estimates of urban population can be produced on a regular basis.

8. Summary

This paper develops an *alternative* definition for urban areas in Sri Lanka based on a review of existing definitions in other countries and stakeholder perceptions. Here a GND is defined as an urban area if it has a minimum population of 750 persons, a population density greater than 500 persons per km², firewood dependence of less than 95 percent households, and well water dependence of less than 95 percent households. When defined in this manner, 43.8 percent of the Sri Lankan population is estimated to live in 3,659 GNDs classified as urban areas. The important feature of this definition is its dynamic nature in contrast to the rigidities associated with the local government based administrative definition. Here GNDs can change their urban classification depending on their latest performance in terms of the each of the four criteria. Compared to AI, which is based on criteria set forth by international requirements, this newly developed definition's underlying foundations are more Sri Lanka

specific and are able to reflect the country scenario.

This new definition can be applied to many datasets such as the LFS, DHS, and HIES to obtain data with diverse variables that would facilitate the way forward in the planned Western Region Megapolis Project, with in-depth research on housing, health and employment in urban areas in Sri Lanka, to name a few.

Currently, Sri Lanka is at the crossroad of a major structural transformation of moving from a predominantly rural to a predominantly urban population. To accurately target and plan urbanization in Sri Lanka, it is important to clearly distinguish actual urban areas from actual rural areas. If targeting is based on an obsolete definition of urbanization, areas with urban characteristics misclassified as rural would be allocated with insufficient funds and inappropriate development plans and once again lead to messy urbanization. As noted by the Minister of Western Development and Region Megapolis, PS's such as Homagama, Beruwala and

Weligama are administratively classified as rural despite having many urban characteristics. When such areas with urban characteristics are governed like rural areas, there would be sub-optimal growth due to the absence of proper urban management (Gunawardane, 2015). The usual facilities provided in urban areas (by the respective MC or UC) such as garbage collection, street lights, drainage and sewerage facilities, construction and maintenance of roads, and fire protection services may be beyond the scope and the budget of a PS. Hence, better identification of urban areas would promote greater allocation of central government funds as well as increase property tax revenue - which Wasantha et al. (2013) identifies as the main source of revenue of local authorities. This new definition allows to align actual urbanization with statistical urbanization- urbanization measured as per a definition, to better target budgetary allocations for the provision of appropriate urban and rural services and facilities.

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Appendices

Table A1: Distribution of Municipal and Urban Councils in 2011

Province	District	Municipal Council	Urban Council
Western	Colombo	Colombo Municipal Council	Kolonnawa Urban Council
Western	Colombo	Dehiwela Mt. Lavinia Municipal Council	Seethawaka Pura Urban Council
Western	Colombo	Sri Jayawardenapura Kotte Municipal Council	Maharagama Urban Council
Western	Colombo	Kaduwela Municipal Council	Boralasgamuwa Urban Council
Western	Colombo	Moratuwa Municipal Council	Kesbewa Urban Council
Western	Gampaha	Negombo Municipal Council	Wattala Urban Council
Western	Gampaha	Gampaha Municipal Council	Peliyagoda Urban Council
Western	Gampaha		Katunayaka – Seeduwa Urban Council
Western	Gampaha		Minuwangoda Urban Council
Western	Gampaha		Ja-ela Urban Council
Western	Kalutara		Panadura Urban Council
Western	Kalutara		Horana Urban Council
Western	Kalutara		Kalutara Urban Council
Western	Kalutara		Beruwala Urban Council
North Western	Kurunegala	Kurunegala Municipal	Kuliyapitiya Urban Council
North Western	Puttalam		Puttalam Urban Council
North Western	Puttalam		Chilaw Urban Council
Central	Kandy	Kandy Municipal Council	Wattegama Urban Council
Central	Kandy		Kadugannawa Urban Council
Central	Kandy		Gampola Urban Council
Central	Kandy		Nawalapitiya Urban Council
Central	Matale	Matale Municipal Council	
Central	Matale	Dambulla Municipal Council	
Central	Nuwara Eliya	Nuwara Eliya Municipal Council	Hatton-Dickoya Urban Council
Central	Nuwara Eliya		Thalawakele-Lindula Urban Council
Uva	Badulla	Badulla Municipal Council	Haputale Urban Council
Uva	Badulla	Bandarawela Municipal Council	
Southern	Galle	Galle Municipal Council	Ambalangoda Urban Council
Southern	Galle		Hikkaduwa Urban Council
Southern	Matara	Matara Municipal Council	Weligama Urban Council
Southern	Hambantota	Hambantota Municipal Council	Tangalle Urban Council
Sabaragamuwa	Rathnapura	Rathnapura Municipal Council	Balangoda Urban Council
Sabaragamuwa	Rathnapura		Embilipitiya Urban Council
Sabaragamuwa	Kegalle		Kegalle Urban Council
North Central	Anuradhapura	Anuradhapura Municipal Council	
Northern	Jaffna	Jaffna Municipal Council	Point Pedro Urban Council
Northern			Velvetithurei Urban Council
Northern			Chavakachchery Urban Council
Northern	Vavuniya		Vavuniya Urban Council
Northern	Mannar		Mannar Urban Council
Eastern	Batticaloa	Batticaloa Municipal Council	Kargabkudi Urban Council
Eastern	Batticaloa		Eravur Urban Council
Eastern	Ampara	Kalmunai Municipal Council	Ampara Urban Council
Eastern	Ampara	Akkarai pattu Municipal Council	
Eastern	Trincomalee		Trincomalee Urban Council
Eastern	Trincomalee		Kinniya Urban Council

Source: MPCLG (n.d.).

Table A2: List of Pradesheeya Sabhas in -2011

District	Pradeshiya Sabha	District	Pradeshiya Sabha	District	Pradeshiya Sabha
Colombo	Homagama		Haldummulla	Anuradhapura	Galenbindunuwewa
	Kotikawatta		Hali-Ela		Galnewa
	Seethawaka		Haputale		Horowpathana
Gampaha	Attanagalla		Kandeketiya		Ipalogama
	Biyagama		Lunugala		Kahatagasdigiliy
	Gampaha		Mahiyanganaya		Kebathigollawa
	Ja-ela		Meegahakiula		Kekirawa
	Katana		Passara		Medawachchiya
	Kelaniya		Rideemaliyadda		Mihintale
	Mahara		Soranatota		Nochchiyagama
	Meerigama		Uva Paranagama		Nuwaragam Palatha (East)
	Minuwangoda		Welimada		Nuwaragam Palatha(Central)
	Wattala	Monaragala	Badalkumbara		Padaviya
	Agalawatta		Bibila		Palagala
Kalutara	Bandaragama		Buttala		Rajanganaya
	Beruwela		Kataragama		Rambewa
	Bulathsinhala		Madulla		Thalawa
	Dodangoda		Medagama		Thirappane
	Horana		Moneragala	Polonnaruwa	Dimbulagala
	Kalutara		Siyambalanduwa		Elaher
	Madurawela		Thanamalwila		Hingurakgoda
	Matugama		Wellawaya		Lankapura
	Palindanuwara	Galle	Akmeemana		Medirigiriya
	Panadura		Ambalangoda		Thamankaduwa
	Walallawita		Baddegama		Welikanda
Kurunegala	Alawwa		Balapitiya	Jaffna	Chavakachcheri
	Bingiriya		Bentota		Delft
	Galgamuwa		Bope-Poddala		Karinagar
	Giribawa		Elpitiya		Kayts
	Ibbagamuwa		Habaraduwa		Nallur
	Kobeiagane		Imaduwa		Point Pedro
	Kuliyapitiya		Karandeniya		Vadamarachchi (South-West)
	Kurunegala		Nagoda		Valikamam (East)
	Mahawa		Neluwa		Valikamam (North)
	Mawathagama		Niyagama		Valikamam (West)
	Narammala		Raggama		Valikamam(South)
	Nikaweratiya		Thawalama		Valikamam(South-West)
	Panduwasnuwara		Welivitiya-Divithura	Velane	
	Pannala		Yakkalamulla	Kilinochchi	Karachchi
	Polgahawela	Matara	Akuressa		Pachchilaipalli
	Polpithigama		Athuraliya		Poonakari
	Ridigama		Devinuwara	Mannar	Mannar
	Udubaddawa		Dickwella		Mannei West
	Wariyapola		Hakmana		Musali

Table A2 Contd....

District	Pradeshiya Sabha	District	Pradeshiya Sabha	District	Pradeshiya Sabha	
Puttlam	Anamaduwa		Kamburupitiy		Nanththan	
	Arachchikattuwa		Kirinda-Puhulwell	Vavuniya	Vavuniya North	
	Chilaw		Kotapola		Vavuniya South Sinhala	
	Kalpitiya		Malimbada		[.0	
	Karuwalagaswewa		Matara		Vavuniya South Tamil	
	Nattandiya		Mulatiyana	Mullativu	Mannei (East)	
	Nawagattegama		Pasgoda		Maritimepattu	
	Puttalam		Pitabeddara		Puthukudiruppu	
	Wanathawilluwa		Thihagoda		Thunukkai	
	Wennappuwa		Weligama	Batticaloa	Eravurpattu	
Kandy	Akurana	Hambantota	Ambalantota		Koralaipattu	
	Ganga Ihala Korale		Angunakolapelassa	Koralaipattu		
	Harispattuwa		Beliatta		Koralaipattu	
	Kandy Gravets & Gangawata		Hambantota		Manmunai	
	Kundasale		Katuwana		Manmunai	
	Meda Dumbara		Lunugamvehera		Manmunai Wes	
	Minipe		Sooriyawewa		Manmunai South-West	
	Panwila		Tangalle		Porativupattu	
	Pasbage Korale		Tissamaharama	Ampara	Addalachchnai	
	Patadumbara		Weeraketiya		Akkaraipattu	
	Patahewaheta	Rathnapura	Ayagama		Alayadivembu	
	Pujapitiya		Balangoda		Damana	
	Thumpane		Ehaliyagoda		Dehiyattakandiya	
	Uda Palatha		Embilipitiya		Irrakkaram	
	Ududumbara		Godakawela		Karaitivu	
	Udunuwara		Imbulpe		Lahugala	
	Yatinuwara		Kahawatta		Mahaoya	
	Matale	Ambanganga		Kalawana		Namaloya
		Dambulla		Sabha		Navithanveli
Galewala			Kolonna		Nindavur	
Laggala-Pallegama		Kuruwita		Padiyatalawa		
Matale			Nivithigala		Potuvil	
Naula			Pelmadulla		Sammanthurai	
Pallepola			Rathnapura		Thirukkovi	
Rattota			Weligepola		Uhana	
Ukuwela		Kegalle	Aranayake	Trincomalee	Seruvila	
Wilgamuwa			Bulathkohupitiya		Kantalai	
Yatawatta		Dehiowita		Morawewa		
Nuwara Eliya	Ambagamuwa		Deraniyagala		Gomarankadawala	
	Hanguranketha		Galgamuwa		Padavisripura	
	Kothmale		Kegalle		Trincomalee Town & Gravets	
	Nuwara Eliya		Mawanella		Kuchchaveli	
	Walapane		Rambukkana		Thampalakamam	
Badulla	Badulla		Ruwanwella		Muttur	
	Bandarawela		Warakapola		Kinniya	
	Ella		Yatiyantota		Verugal	

Source: MPCLG (n.d.).

Table A3: Urban Definition in Countries - 2007 2011**AFRICA**

Botswana	Agglomeration of 5 000 or more inhabitants where 75 per cent of the economic activity is non-agricultural.
Burundi	Commune of Bujumbura.
Comoros	Administrative centres of prefectures and localities of 5 000 or more inhabitants.
Egypt	Governorates of Cairo, Alexandria, Port Said, Ismailia, Suez, frontier governorates and capitals of other governorates, as well as district capitals.
Equatorial Guinea	District centres and localities with 300 dwellings and/or 1 500 inhabitants or more.
Ethiopia	Localities of 2 000 or more inhabitants.
Liberia	Localities of 2 000 or more inhabitants.
Malawi	All townships and town planning areas and all district centres.
Mauritius	Towns with proclaimed legal limits.
Niger	Capital city, capitals of the departments and districts
Senegal	Agglomerations of 10 000 or more inhabitants.
South Africa	Places with some form of local authority.
Sudan	Localities of administrative and/or commercial importance or with population of 5 000 or more inhabitants.
Swaziland	Localities proclaimed as urban.
Tunisia	Population living in communes.
United Republic of Tanzania	16 gazetted townships.
Zambia	Localities of 5 000 or more inhabitants, the majority of whom all depend on non-agricultural activities.

AMERICA, NORTH

Canada	Places of 1 000 or more inhabitants, having a population density of 400 or more per square kilometre.
Costa Rica	Administrative centres of cantons.
Cuba	Population living in a nucleus of 2 000 or more inhabitants.
Dominican Republic	Administrative centres of municipalities and municipal districts, some of which include suburban zones of rural character.
El Salvador	Administrative centres of municipalities.
Greenland	Localities of 200 or more inhabitants.
Guatemala	Municipality of Guatemala Department and officially recognized centres of other departments and municipalities.
Haiti	Administrative centres of communes.
Honduras	Localities of 2 000 or more inhabitants, having essentially urban characteristics.
Mexico	Localities of 2 500 or more inhabitants.
Nicaragua	Administrative centres of municipalities and localities of 1 000 or more inhabitants with streets and electric light.
Panama	Localities of 1 500 or more inhabitants having essentially urban characteristics. Beginning 1970, localities of 1 500 or more inhabitants with such urban characteristics as streets, water supply systems, sewerage systems and electric light.
Puerto Rico	Agglomerations of 2 500 or more inhabitants, generally having population densities of 1 000 persons per square mile or more. Two types of urban areas urbanized areas of 50 000 or more inhabitants and urban clusters of at least 2 500 and less than 50 000 inhabitants.
United States of America	Agglomerations of 2 500 or more inhabitants, generally having population densities of 1 000 persons per square mile or more. Two types of urban areas urbanized areas of 50 000 or more inhabitants and urban clusters of at least 2 500 and less than 50 000
United States Virgin Islands	Agglomerations of 2 500 or more inhabitants, generally having population densities of 1 000 persons per square mile or more. Two types of urban areas urbanized areas of 50 000 or more inhabitants and urban clusters of at least 2 500 and less than 50 000 inhabitants. As of Census 2000, no urbanized areas are identified in the United States Virgin Islands.)

Table A3 Contd...../

AMERICA, SOUTH

Argentina	Populated centres with 2 000 or more inhabitants.
Bolivia	Localities of 2 000 or more inhabitants.
Brazil	Urban and suburban zones of administrative centres of municipalities and districts.
Chile	Populated centres which have definite urban characteristics such as certain public and municipal services.
Ecuador	Capitals of provinces and cantons. Falkland Islands (Malvinas)
Paraguay	Cities, towns and administrative centres of departments and districts.
Peru	Populated centres with 100 or more dwellings.
Suriname	The districts of Paramaribo and Wanica.
Uruguay	Cities.
Venezuela	Centres with a population of 1 000 or more inhabitants.

ASIA

Armenia	Cities and urban-type localities, officially designated as such, usually according to the criteria of number of inhabitants and predominance of agricultural, or number of non-agricultural workers and their families.
Azerbaijan	Cities and urban-type localities, officially designated as such, usually according to the criteria of number of inhabitants and predominance of agricultural, or number of non-agricultural workers and their families.
Bahrain	Communes or villages of 2 500 or more inhabitants.
Cambodia	Towns.
China	Cities only refer to the cities proper of those designated by the State Council. In the case of cities with district establishment, the city proper establishment, the city proper refers to the seat of the city government and other areas of streets under the administration district with the of the city. For the city population density below 1 500 people per kilometre and the city without district establishment, if the urban construction of the district or city government seat has extended to some part of the neighboring designated town(s) or township(s), the city proper does include the whole administrative area of the town(s) or township(s).
Cyprus	Urban areas are those defined by local town plans.
Georgia	Cities and urban-type localities, officially designated as such, usually according to the criteria of number of inhabitants and predominance of agricultural, or number of non-agricultural workers and their families.
India	Towns (places with municipal corporation, municipal area committee, town committee, notified area committee or cantonment board); also, all places having 5 000 or more inhabitants, a density of not less than 1 000 persons per square mile or 400 per square kilometre, pronounced urban characteristics and at least three fourths of the adult male population employed in pursuits other than agriculture.
Indonesia	Places with urban characteristics.
Iran (Islamic Republic of)	Every district with a municipality.
Israel	All settlements of more than 2 000 inhabitants, except those where at least one third of households, participating in the civilian labour force, earn their living from agriculture.
Japan	City (shi) having 50 000 or more inhabitants with 60 per cent or more of the houses located in the main built-up areas and 60 per cent or more of the population (including their dependants) engaged in manufacturing, trade or other urban type of business. Alternatively, a shi having urban facilities and conditions as defined by the prefectural order is considered as urban.
Kazakhstan	Cities and urban-type localities, officially designated as such, usually according to the criteria of number of inhabitants and predominance of agricultural, or number of non-agricultural workers and their families.
Kyrgyzstan	Cities and urban-type localities, officially designated as such, usually according to the criteria of number of inhabitants and predominance of agricultural, or number of non-agricultural workers and their families.
Malaysia	Gazetted areas with population of 10 000 and more.
Maldives	Malé, the capital.
Mongolia	Capital and district centres.
Pakistan	Places with municipal corporation, town committee or cantonment.
Republic of Korea	For estimates : Places with 50 000 or more inhabitants. For census: the figures are composed in the basis of the minor administrative divisions such as Dongs (mostly urban areas) and Eups or Myeons (rural areas).
Sri Lanka	Urban sector comprises of all municipal and urban council areas.
Syrian Arab Republic	Cities, Mohafaza centres and Mantika centres, and communities with 20 000 or more inhabitants.
Tajikistan and	Cities and urban-type localities, officially designated as such, usually according to the criteria of number of inhabitants and predominance of agricultural, or number of non-agricultural workers and their families.
Thailand	Municipal areas.
Turkey	Population of settlement places, 20 001 and over.
Turkmenistan	Cities and urban-type localities, officially designated as such, usually according to the criteria of number of inhabitants and predominance of agricultural, or number of non-agricultural workers and their families.
Uzbekistan	Cities and urban-type localities, officially designated as such, usually according to the criteria of number of inhabitants and predominance of agricultural, or number of non-agricultural workers and their families.
Viet Nam	Urban areas include inside urban districts of cities, urban quarters and towns. All other local administrative units (communes) belong to rural areas.

Table A3 Contd...../

EUROPE	
Albania	Towns and other industrial centres of more than 400 inhabitants.
Austria	Communes of more than 5 000 inhabitants.
Belarus	Cities and urban-type localities, officially designated as such, usually according to the criteria of number of inhabitants and predominance of agricultural, or number of non-agricultural workers and their families.
Bulgaria	Towns, that is, localities legally established as urban.
Czech Republic	Localities with 2 000 or more inhabitants.
Estonia	Cities and urban-type localities, officially designated as such, usually according to the criteria of number of inhabitants and predominance of agricultural, or number of non-agricultural workers and their families.
Finland	Urban communes.
France	Communes containing an agglomeration of more than 2 000 inhabitants living in contiguous houses or with not more than 200 metres between houses, also communes of which the major portion of the population is part of a multicommunal agglomeration of this nature.
Greece	Population of municipalities and communes in which the largest population centre has 10 000 or more inhabitants. Including also the population of the 18 urban agglomerations, as these were defined at the census of 1991, namely
Hungary	Budapest and all legally designated towns.
Iceland	Localities of 200 or more inhabitants.
Ireland	Cities and towns including suburbs of 1 500 or more inhabitants.
Latvia	Cities and urban-type localities, officially designated as such, usually according to the criteria of number of inhabitants and predominance of agricultural, or number of non-agricultural workers and their families.
Lithuania	Urban population refers to persons who live in cities and towns, i.e., the population areas with closely built permanent dwellings and with the resident population of more than 3 000 of which 2/3 of employees work in industry, social infrastructure and business. In a number of towns the population may be less than 3 000 since these areas had already the status of "town" before the law was enforced (July 1994)
Netherlands	Urban: Municipalities with a population of 2 000 and more inhabitants. Semi-urban: Municipalities with a population of less than 2 000 but with not more than 20 per cent of their economically active male population engaged in agriculture, and specific residential municipalities of commuters.
Norway	Localities of 200 or more inhabitants.
Poland	Towns and settlements of urban type, e.g. workers' settlements, fishermen's settlements, health resorts.
Portugal	Agglomeration of 10 000 or more inhabitants.
Republic of Moldova	Cities and urban-type localities, officially designated as such, usually according to the criteria of number of inhabitants and predominance of agricultural, or number of non-agricultural workers and their families.
Romania	Cities, municipalities and other towns
Russian Federation	Cities and urban-type localities, officially designated as such, usually according to the criteria of number of inhabitants and predominance of agricultural, or number of non-agricultural workers and their families.
Slovakia	138 cities with 5 000 inhabitants or more.
Spain	Localities of 2 000 or more inhabitants. Switzerland
Ukraine	Cities and urban-type localities, officially designated as such, usually according to the criteria of number of inhabitants and predominance of agricultural, or number of non-agricultural workers and their families.
United Kingdom of and Northern Ireland	Settlements where the population is 10 000 or above.
OCEANIA	
American Samoa	Agglomerations of 2 500 or more inhabitants, generally having population densities of 1 000 persons per square mile or more. Two types of urban areas
Guam	Agglomerations of 2 500 or more inhabitants, generally having population densities of 1 000 persons per square mile or more, referred to as "urban clusters": urbanized areas of 50 000 or more inhabitants and urban clusters of at least 2 500 and less than 50 000 inhabitants. (As of Census 2000, no urbanized areas are identified in American Samoa.)
New Caledonia	Nouméa and communes of Païta, Nouvel Dumbéa and Mont-Dore.
New Zealand	All cities, plus boroughs, town districts, townships and country towns with a population of 1 000 or more.
Northern Mariana Islands	Agglomerations of 2 500 or more inhabitants, generally having population densities of 1 000 persons per square mile or more. Two types of urban areas.

Source: UNSTATS (2007).

Table A4: GN Level Population Level Summary by District

District	mean	SD	min	max	p1	p5	p10	p25	p50	p75	p90	p95	p99
Ampara	1291.1	876.2	101	10860	247	484	557	778	1141	1506	2076	2742	4369
Anuradhapura	1240	665.9	121	6063	266	467	616	811	1130.5	1530	1881	2302	4263
Badulla	1438.1	770.3	148	5153	287	467	587	855	1307	1879	2445	2823	4027
Batticaloa	1527.6	907	242	5420	315	505	624	914	1271	1960	2786	3268	4837
Colombo	4173	3196	533	28003	707	1071	1367	2059	3358	5233	7582	9914	18000
Galle	1188.1	603.5	212	5514	354	516	605	787	1068	1429	1855	2298	3555
Gampaha	1958.2	1377	276	11686	462	625	764	1010	1499	2517	3862	4856	6682
Hambantota	1041.5	640.7	182	7302	304	423	496	655.5	877.5	1249	1740	2168	3109
Kalutara	1603.6	865.9	103	7297	452	625	737	972	1412	2022	2753	3230	4273
Kandy	1158.7	818.8	76	7040	195	330	422	620	922	1467	2201	2629	4230
Kegalle	1467.1	743.3	287	4953	458	602	748	983	1296	1775	2405	2865	4445
Kilinochchi	1261.2	821.2	240	5575	240	336	444.5	687	1088.5	1699	2218.5	2404	5575
Kurunegala	1005.3	449.9	161	4326	337	482	561	710	907	1188	1551	1881	2457
Mannar	650.78	570.3	15	3407	23	55	167	277	489	789	1504	1834	2486
Matale	889.05	590.7	56	4864	132	253	362	509	759	1090	1563	1950	2918
Matara	1252.4	549.8	384	4004	472	609	690.5	889	1148	1446	1943	2397	3181
Moneragala	1414	876.4	340	6442	444	553	662	852	1179	1700	2406	3090	5082
Mullaitivu	709.52	568.5	2	3778	31	123	202	356	570.5	940	1374	1651	2995
NuwaraEliya	1449.4	1474	58	10150	170	292	367	500	785	1869	3598	4507	6996
Polonnaruwa	1381.3	603.4	126	5300	470	653	772	963	1296	1692	2077	2349	3176
Puttalam	1391.2	1185	113	14017	407	514	593	794.5	1090.5	1526	2377	3185	6774
Ratnapura	1892.2	1042	340	6689	462	682	829	1111	1659	2396	3246	4016	5499
Trincomalee	1664.7	1149	1	6860	39	268	486	844.5	1416.5	2228	3173	3858	5544
Vavuniya	1687.4	1971	26	9747	47	129	192	527	836.5	2269	4674	6051	9313

Source: Authors calculations.

Table A5: GN Level Population Density Summary by District

District	mean	SD	min	max	p1	p5	p10	p25	p50	p75	p90	p95	p99
Ampara	4101	6967	1	42460	5	27	59	146	708	5589	12000	18000	35000
Anuradhapura	317	619	3	7474	9	36	48	84	164	324	585	938	3924
Badulla	6292	11000	14	84826	294	682	914	1591	3214	6229	13000	21000	74000
Batticaloa	3350	5950	5	37247	7	28	61	245	1130	3262	9231	16000	32000
Colombo	6481	7805	71	57013	252	471	738	1884	3928	8146	14000	20000	41000
Galle	1452	1680	30	13990	113	206	270	455	825	1697	3727	4772	8183
Gampaha	2392	2401	195	26653	313	467	583	922	1587	3075	5033	6832	12000
Hambantota	536	529	7	4824	27	95	173	257	389	588	1043	1466	2974
Kalutara	1886	2589	3	23726	87	167	233	399	873	2264	5021	7297	12000
Kandy	1610	2090	6	43650	27	147	249	513	1034	2072	3694	4900	7683
Kegalle	863	1215	23	18588	88	208	263	397	608	930	1495	2371	4073
Kilinochchi	326	693	9	4469	9	17	20	58	102	260	690	1184	4469
Kurunegala	546	744	25	10780	68	121	158	245	374	591	966	1361	3594
Mannar	296	502	1	2972	2	4	11	33	120	354	793	1233	2826
Matale	731	1172	3	10786	11	33	79	195	392	759	1478	2491	6380
Matara	1365	1951	36	20325	150	219	280	448	675	1295	3223	5058	9934
Moneragala	211	224	5	2251	6	25	36	76	158	264	430	600	1019
Mullaitivu	208	403	1	2579	2	4	5	17	63	195	540	1112	1894
NuwaraEliya	649	619	8	5548	30	114	182	299	479	782	1284	1708	2923
Polonnaruwa	383	520	0	4670	5	29	64	118	237	391	805	1201	3286
Puttalam	1186	3552	1	70085	14	56	89	201	463	1222	2328	3568	12000
Ratnapura	609	774	24	6721	37	85	121	224	392	640	1251	1946	4375
Trincomalee	1742	4238	0	33846	0	9	21	76	228	1302	5199	7939	25000
Vavuniya	381	730	2	4350	2	10	14	31	101	319	1158	2211	4350

Source: Authors calculations.

Table A6: GN Level Firewood Dependency Summary by District

District	mean	SD	min	max	p1	p5	p10	p25	p50	p75	p90	p95	p99
Ampara	77.0	25.2	5.5	100.0	9.9	27.5	33.8	60.0	87.7	97.8	99.4	99.7	100.0
Anuradhapura	94.6	10.6	16.9	100.0	38.7	75.5	86.9	95.0	97.8	99.2	100.0	100.0	100.0
Badulla	94.1	10.7	26.8	100.0	42.3	70.3	84.8	94.5	97.9	99.4	100.0	100.0	100.0
Batticaloa	78.7	26.4	3.5	100.0	7.5	15.3	31.9	67.1	92.1	97.4	99.1	99.7	100.0
Colombo	40.8	30.1	0.0	100.0	0.5	1.9	4.5	13.6	32.9	68.3	86.5	93.4	98.1
Galle	85.0	15.9	7.5	100.0	27.0	48.1	62.5	79.9	90.4	96.3	98.4	99.0	100.0
Gampaha	73.7	24.1	0.5	100.0	10.3	24.9	33.9	59.5	82.4	93.3	96.9	98.4	100.0
Hambantota	94.0	8.7	27.9	100.0	56.7	76.4	84.5	92.8	97.4	99.1	100.0	100.0	100.0
Kalutara	80.9	17.9	11.0	100.0	22.4	44.0	53.6	71.3	87.0	95.1	97.9	98.8	100.0
Kandy	86.3	17.6	5.4	100.0	20.3	45.1	62.1	81.9	93.4	98.1	99.4	100.0	100.0
Kegalle	94.2	7.8	47.1	100.0	54.8	78.7	86.2	92.6	97.1	98.8	99.5	100.0	100.0
Kilinochchi	96.8	3.7	76.2	100.0	76.2	90.4	93.5	96.5	97.5	98.9	99.4	100.0	100.0
Kurunegala	95.5	8.2	9.3	100.0	59.4	81.5	88.6	95.4	98.2	99.4	100.0	100.0	100.0
Mannar	92.1	14.1	0.0	100.0	25.9	60.6	78.6	92.7	96.9	99.2	100.0	100.0	100.0
Matale	94.1	10.4	18.9	100.0	44.5	72.9	84.9	93.6	97.9	99.5	100.0	100.0	100.0
Matara	88.3	14.4	13.0	100.0	31.2	58.7	70.0	84.8	94.0	97.7	99.1	99.5	100.0
Moneragala	97.2	5.8	42.0	100.0	73.6	87.5	92.7	97.5	99.0	99.6	100.0	100.0	100.0
Mullaitivu	97.1	3.8	76.6	100.0	78.5	90.9	93.8	96.2	98.0	99.5	100.0	100.0	100.0
NuwaraEliya	91.3	14.2	21.4	100.0	29.7	60.7	76.0	90.5	96.7	99.1	100.0	100.0	100.0
Polonnaruwa	94.3	8.9	49.9	100.0	52.6	72.3	85.7	94.0	97.5	99.0	99.6	100.0	100.0
Puttalam	89.6	13.0	14.8	100.0	30.4	64.3	74.5	86.3	93.7	98.1	99.5	100.0	100.0
Ratnapura	94.1	9.1	32.2	100.0	53.4	76.2	85.3	93.3	97.5	99.1	99.7	100.0	100.0
Trincomalee	87.4	19.8	8.1	100.0	11.2	39.9	64.8	87.1	95.5	98.3	99.6	100.0	100.0
Vavuniya	92.0	14.3	25.0	100.0	26.8	60.4	75.3	93.3	97.3	98.9	100.0	100.0	100.0

Source: Authors calculations.

Table A7: GN Level Well Water Dependency Summary by District

District	mean	SD	min	max	p1	p5	p10	p25	p50	p75	p90	p95	p99
Ampara	55	36	0	100	0	4	7	22	53	95	100	100	100
Anuradhapura	58	32	0	100	1	4	11	28	63	90	98	99	100
Badulla	31	29	0	100	0	1	2	8	22	48	85	93	99
Batticaloa	84	20	3	100	11	39	52	78	92	98	100	100	100
Colombo	34	32	0	99	0	0	1	3	23	62	85	93	98
Galle	65	34	0	100	0	2	8	37	79	95	99	99	100
Gampaha	73	30	0	100	1	6	17	59	87	97	99	99	100
Hambantota	26	29	0	100	0	0	0	3	14	40	77	91	99
Kalutara	66	30	0	100	1	9	17	42	75	91	98	99	100
Kandy	34	29	0	100	0	1	2	9	26	58	78	87	96
Kegalle	62	30	1	100	3	6	13	39	67	88	98	99	100
Kilinochchi	91	19	0	100	0	40	76	92	98	100	100	100	100
Kurunegala	82	21	7	100	15	33	48	74	91	97	99	100	100
Mannar	62	38	0	100	0	0	0	25	76	97	100	100	100
Matale	46	31	0	100	0	2	4	18	46	72	91	97	100
Matara	65	28	0	100	1	8	16	44	72	88	96	98	100
Moneragala	51	32	0	100	1	4	7	21	53	80	94	96	99
Mullaitivu	89	18	0	100	15	60	70	88	96	99	100	100	100
NuwaraEliya	22	24	0	100	0	0	1	4	13	32	58	76	98
Polonnaruwa	57	31	0	100	1	6	10	30	60	86	97	98	99
Puttalam	52	30	0	100	0	5	11	25	52	79	93	96	99
Ratnapura	35	26	0	100	0	2	4	12	30	56	77	84	94
Trincomalee	61	35	0	100	2	5	11	25	71	97	100	100	100
Vavuniya	77	20	15	100	25	40	49	64	83	94	99	100	100

Source: Authors calculations.

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